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After the body of the kettle had been brought into its true shape, the first step towards improvement was to make a not very thick solution of glue in water, and lay it with a small brush, into all the joints; avoiding spreading the glue beyond the joints as much as possible. This, on drying, set all the fragments in place quite firmly. The upper pieces around the hole, however, were not glued, but left supported by the gummed slips only for convenient insertion of the last pieces. Slips were next gummed on the inside across all gaps left by missing fragments. I then made a kind of cement, or mortar from pieces of very soft burned brick, pounded to dust, sifted, shaded to the color of the kettle with lamp-black, and moistened to a plastic state with not very thick glue water. With this mortar all the joints and gaps were filled on the outside. But the gaps were designedly not filled quite to the required thickness with one coat, as the mortar would shrink and crack somewhat in drying. Wherever these cracks appeared, glue was rubbed into them with the brush before laying on the final coat of cement. When this coat was dry it was smoothed with old files and sand paper and groove-marked in imitation of the unbroken surface. Protuberances in the cement too large to be readily filed down in a dry state, were first surface-softened by slight damping. The hole at the top was next underlaid with slips, and filled. Finally the slips were all removed from the interior by damping with a moist cloth, and any crevices that appeared were filled with cement.

From a basket full of nearly worthless shards was thus reconstructed a single relic, very rare (at least in Connecticut) whole and strong, showing no obvious breakage, as good as new for ethnological use, and as indestructible if not soaked with water, as any specimen of ceramic art.—E. W. Ellsworth, *East Windsor Hill, Ct.*

MICROSCOPY.

Beaded Silica Films.—Mr. Henry J. Slack has produced delicate films of silica, by mixing powdered glass, powdered fluor spar and sulphuric acid in a flask and conducting through a glass pipe the gas which escapes from the heated mixture into a dish containing glycerine and water. By contact with pure water the gaseous silica is deposited so suddenly and violently as to produce only amorphous particles, and a similar result is obtained when silica is precipitated from its alkaline salts or water-glasses dissolved in water; but a mixture of glycerine retards the process and gives opportunity for the formation of definite forms. The films thus produced, washed and examined in water or mounted in balsam, either simulate organic cell forms, with cavities formed by the bursting of minute gas-bubbles, or consist of beads or spherules exhibiting remarkable regularity of size and arrangement; the beads seem to vary from $\frac{1}{30000}$ to $\frac{1}{100000}$ inch or less; and they appear to least advantage, in size, under the highest powers. They seem calculated to add to our knowledge of high power definition if not to throw light upon questions of crystallization and organization. Some of the films produced the beautiful polychromatic effects so often mentioned by Dr. Pigott as occurring in beaded diatoms and scales.

CELL-CULTURE IN THE STUDY OF FUNGI.—Ph. Van. Tieghem and G. LeMonnier in their published researches on the Mucorini give a good working account of their method of cell-culture which is applicable not only to the smaller fungi but to many other plants. A glass cell $\frac{1}{5}$ or $\frac{1}{6}$ inch is cemented upon a glass slide, and a suitable cover-glass is kept in place by three minute drops of oil placed on the edge of the ring. The contained air is kept moist by a few drops of water placed in the bottom of the cell, while a very small drop of the nutritive fluid is placed on the lower surface of the cover-glass, and in this drop the spore to be cultivated is sown. The whole drop, and indeed the entire contents of the cell, can now be examined with suitable powers, and the germination and development of the plant traced hour after hour from any given spore, with the greatest certainty and ease. Extraneous spores will sometimes be introduced, but they are easily detected.

HANDLING DIATOMS.—Capt. Lang, of the Reading Microscopical Society, gives "A useful Hint" to persons who select and arrange diatoms and pursue similar minute work under the microscope. Hairs, from various animals, whipped on to delicate handles, are generally satisfactory, those of the badger, or fine camel-hair or sable brushes, being generally useful. But some diatoms refuse to be thus picked up, and these he finds to be readily handled by means of a fine feather. The fine, stiff, elastic, and sharply pointed feathers on the extreme end of the carpal joints of the wings of the golden plover and of the woodcock were found to be especially suitable.

REPRODUCTION OF DESMIDS.—Prof. Leidy, at a late meeting of the Academy of Natural Sciences of Philadelphia, made some remarks on the mode of reproduction and growth of the Desmids. In illustration he described a common species of Docidium or Pleurotænium. This consists of a long cylindroid cell constricted at the middle and slightly expanded each side of the constriction. When the plant is about to duplicate itself the cell-wall divides transversely at the constriction. From the open end of each half-cell there protrudes a colorless mass of protoplasm defined by the primordial utricle. The protrusions of the half-cells adhere together and continue to grow. The bands of endochrome now extend into the protrusions and subsequently keep pace with their growth. The protrusions continue to grow until they acquire the length and form of the half-cells from which they started. The exterior of the new half-cells thus produced hardens or becomes a cell-wall like that of the parent half-cells. In this condition two individuals of Docidium are frequently observed before separation. During the growth of the new half-cells the circulation of granules in the colorless protoplasm is quite active. In a species of Docidium $1\frac{1}{2}^{mm}$ long by $\frac{1}{10}^{mm}$ broad, the growth of the new half-cells was observed to be at the rate of about $\frac{1}{3}^{mm}$ in an hour.

ANGULAR APERTURES.—It is not yet forgotten that at the London examination of the $\frac{1}{6}$ inch lens sent to demonstrate the possibility of obtaining an excessive angular aperture in immersion work on balsam objects, the lens was measured at an adjustment of which nothing to the point was known except that it was not a position of immersion work at all, nor a recognized maximum position for any kind of work; the plain fact being that the accomplished committee were so bent upon teaching us the familiar fact of reduced angle that they seem to have forgotten to look for any other possibility in the case. Nor is it likely to be forgotten as long as Mr. Wenham so far forgets his usual and admirable caution as to allude to the correction of this palpable mistake as an "after quibble," nor while the eminent President of the Royal Microscopical Society utters in his formal address such an astounding statement as the following:—"The lens in this instance was properly corrected as a dry lens, and then after measurement in air it was measured in water and then in very fluid Canada balsam without alteration of the adjustment. It may be quite possible that if the lens had been readjusted so as to give the best image for immersion in balsam, a slightly greater angle might have been obtained; but this would not have been a fair way of making a comparison as it is not the mode in which the glass would ever be employed in actual practice." By not saying squarely, *It is probably true that if the lens had been readjusted so as to give the best image for immersion in water, a greater angle would have been obtained; and this would have been the fair way of making the measurement, as it is the mode in which the glass would be employed in actual practice*, Mr. Brooke lost a rare opportunity to do a noble if not a generous act. As he is well known to be incapable of an intentional sophistry which by adroitly worded phrase should suggest a doubt where none is felt, belittle the concessions which are called for by manifest truth, and say one thing which is true but has no relation to the case at issue, and at the same time imply another thing which does relate to the case but is unqualifiedly incorrect, there is no choice but to conclude that his extraordinary statement, notwithstanding its tone of judicial coolness, was made without that deliberation which the official character of the address demanded.

On the other hand a still more recent lens by the same maker, claiming still more excessive aperture, has been examined by Mr. Wenham by his method of cutting off false light described in the August number of the NATURALIST. By this method, which would seem incapable of excluding any image-forming rays, he succeeded in obtaining a clear and distinctly limited angle for the lens whose light, when not thus protected, was vague and uncertain; the angular aperture at the same time being reduced from "180°" to "112°" which corresponded within a few degrees with the aperture computed trigonometrically from the width of the front lens and the length of the working focus. To this it is answered that with a dry object on the cover there is *no* distance involved and the triangle is impracticable; while accurate focussing upon a stop which is feasible at "uncovered" adjustment, is liable to error from spherical aberration when adjusted for maximum angle. Mr. Tolles' method of demonstrating the utilization of extra-limital rays is by placing a central stop upon the posterior surface of the back system of lenses, so large as to cut off all light when the objective is used dry; so that by no trick of illumination can the light be made to pass through the narrow ring of clear aperture remaining around the stop; but if water be flowed in both above and below the balsam-mounted object, converting both the objective and the illuminating semi-cylinder into immersion arrangements, a well lighted and defined image is immediately produced. With regard to extreme angles in connection with dry objects, Mr. Tolles claims that his much-disputed $\frac{1}{6}$ inch does actually form an image with the most oblique rays that can impinge upon the slide, all other rays being cut off by a card or shutter which can be moved up close to the bottom of the slide.

A Finder for Microscopes with plain stage.—A writer in "Science Gossip" advises a horizontal line ruled across the centre of the stage from side to side. Vertical lines are ruled across this an inch each side of the centre. A large label, say nine-tenths of an inch square, is fixed to each end of the slide. When the object is in position these labels are marked with lines or dots to correspond with the stage-lines below, and by these can easily be returned to the same position on the same stage or any stage ruled exactly to match. Several objects may be indicated on the same slide by as many marks, and a memorandum preserved recording which marks indicate each object; thus 4-7 or $\frac{4}{7}$ records that the object is indicated by the fourth vertical and the seventh horizontal dot or line.

The Right-angled Prism as a substitute for the Mirror for transmitted light.—Mr. Ingpen uses an achromatic doublet, plano-convex, which can be placed when desired close to one side of the right-angled prism for transparent illumination, thus making the prism available as a substitute for both plane and concave mirrors, while the usual form where the condensing lenses are balsamed to the prism is useless for giving parallel light.

Apparatus for giving pressure to objects while drying.—Though spring clips of various kinds are chiefly employed for this purpose, yet a more compact and controllable arrangement is sometimes preferred. A mounting board is often arranged to hold the slides while pressure-rods tipped with cork rest upon the cover-glasses and give the required pressure; these rods being held in a vertical position by being passed through loops of wire or through a couple of perforated shelves one above the other, while they are pulled down with the required degree of force by elastic bands passing over or through them and fastened to hooks or rings below. Such an apparatus, figured and described in "Martin's Manual of Microscopic Mounting," p. 28, is inconvenient chiefly by reason of the difficulty of varying pressure by means of the elastic band. Mr. C. E. Hanaman suggests the employment, as a substitute for the rods, of glass tubes loaded with shot or mercury so as to give the required pressure by their weight. By merely uncorking the tube and pouring a little mercury in or out all necessary changes of pressure may be secured, or the different tubes may be kept filled to different heights and the proper one chosen in each case.

THE NEW TYPE PLATE.—Möller has brought out another of his exquisite plates. This time he photographs, upon the centre of a glass cover, a square of about one-sixth of an inch composed of eighty circles surrounded by a black background with the name of a different diatom photographed under each circle. In the centre of each circle is mounted a diatom corresponding to the label below, two specimens being often introduced to show different views of the same form; of course all is arranged in inverted position on the slide, but under the microscope appears as described. The objects are mounted between two thin glasses which are set in a brass plate three and a quarter inches long and one and a quarter wide.

FIXING DIATOMS.—Mr. J. K. Jackson, in a communication to "Science Gossip" laments that the best "diatomaniacs" hold so tightly the secret of their mounting, and details his own experience for the assistance of others. The diatoms are carefully cleaned and a dip of the material containing them evaporated on a slip which is then placed under a 1½ inch objective. The covers on which to mount have been previously glazed with gum by putting on the centre of each, carefully cleaned, a small drop of a solution formed of an ounce of freshly distilled water and five or six drops of a freshly prepared solution of gum tragacanth or arabic; a number of covers being prepared at once on a wooden rack and dried over a hot plate in order to leave the least possible opportunity for exposure to the "vile inappreciable dust" of the room. With a hair from a cow's neck, mounted in a wooden handle, a diatom is picked out from the dip, at the rate of from eight to ten per minute and disengaged from the hair by dabbing it on the glazed cover. When sufficient have been thus transferred to form a device, as a star, cross, initials, etc., they are placed under the 1½ inch and with the hair they are, with patience as well as tact, pushed, coaxed and driven into the required position, taking care to leave the valves on their backs to avoid insurmountable trouble with air bubbles. The objects are then fixed by bringing them close to the mouth and moistening by a long slow breath. After drying again on the hot plate they may be freely mounted in balsam which may even be boiled if desired and the mounting finished at once. Only on the calmest of days can sufficient immunity from dust be obtained for successful work; and the care of the eyes should never be forgotten during this straining work.

THE PODURA SCALE.—Mr. Charles Brooke, in his President's Address before the Royal Microscopical Society, gives the following cool and excellent criticism on this much debated subject. "The writer, reviewing this subject under the dictates of common sense, when observing the familiar Podura notes of admiration well defined and free from colour, cannot resist the inference that in the objective all aberrations are nicely balanced, and the object truly represented in the visual image; on the contrary, when the same object is viewed as rows of ill-defined beads loaded with colours, it is difficult to avoid suspecting that the appearance is a spectral illusion, resulting from some unexplained diffraction or interference; and this suspicion can hardly be dispelled from his mind by anything short of rigid mathematical demonstration."

NOTES.

MR. JOHN E. GAVIT, President of the American Note Company of New York, died at his residence, Stockbridge, Mass., on the 26th of August, in the fifty-eighth year of his age. It is rare that one finds in the busy walks of life a man who, while filling an office demanding constant attention, unlimited resource of invention, executive ability and diplomacy as well, should yet find time to familiarize himself with the various branches of science, not only understanding them thoroughly, but capable of appreciating and discussing their bearings with those specially engaged in the subject. Of a man of such varied attainments, one would naturally ask, why he had not published the results of his work,—had not made known his inventions. Various reasons may be given: first the